

From the 22d to the 26th, during the passage of the second storm referred to in the summary, severe snowstorms occurred over eastern Wisconsin and northeastern Illinois, where depths of from 6 to 12 inches were recorded, and traffic was interrupted to a considerable extent.

ICE FIELDS AT BUFFALO.

The following paragraph, relative to the extensive ice fields which held at the eastern end of Lake Erie because of the absence of brisk and high southwesterly winds, is from the report of Mr. D. Cuthbertson, District Forecaster, Buffalo, N. Y.:

The ice fields that extended beyond vision, and from shore to shore, on March 31, continued until after April 22, offering more or less obstruction to navigation, which opened on the 10th by the arrival of the steamer *Boyce*. The steamer had battled with the ice fields from the time it was sighted 15 miles out on the afternoon of the 9th until 3:30 p. m. of the 11th, taking about 48 hours to cover the distance. The western limit of the ice became visible on the morning of the 25th. The brisk westerly winds of the 22d-26th drove the large fields down the Niagara River, so that by the 30th the ice had entirely disappeared. The persistent manner in which the fields remained at this end of the lake was due mainly to the absence of brisk and high southwest and west winds, which usually drive the ice down the river.

ERRATUM.

In the report for March, 1910, page 4, 2d paragraph under the topic "Ice in the Great Lakes," the date 1893 should be made to read 1903.

ICE CONDITIONS ON THE GREAT LAKES DURING THE WINTER OF 1909-10.

By N. B. CONGER, Inspector and Marine Agent. Dated Detroit, Mich., May 23, 1910.

There was not as much ice as usual in any of the lakes during the past winter and navigation, in consequence, opened earlier than has been the case in several years. The low temperatures of December, 1909, caused a general formation of ice in all the lakes and over the upper lakes it increased steadily in thickness as the month advanced. The temperatures during January and February, 1910, held the ice firm, but the high temperatures during March, 1910, caused a decided breaking up of the ice fields and there was a general disappearance in all the lakes, except over eastern Erie. In Superior the fields disappeared

from the shore early in March and did not return with the shifting winds, as is usual. The field in Whitefish Bay broke up early and moved out during the first week in April, 1910. The ice in St. Marys River was not as heavy as during the last season and it moved out about 15 days earlier.

In Green Bay the thickness of the ice was about normal, but it broke up and moved out about one month earlier than last season. There were fewer ice fields reported in Lake Michigan than usual, but the fringe of ice along the eastern shore continued during the early part of March. During the latter part of the month, however, no ice was reported south of the Islands.

The ice in the Straits of Mackinac was not as heavy as usual and moved out on April 1, 1910, the earliest opening since 1903. There were few ice fields reported in Huron and most of those were over the northern portion and along the eastern shore. These latter fields disappeared during the first week in April, 1910. In Lake St. Clair the ice formed during the latter part of November, 1909, and reached a thickness of from 14 to 18 inches during December. The ice broke up during the middle of March, 1910, and had run out of the lake by March 22. The Detroit River was blockaded with ice from about Third Street at Detroit, south to the mouth from December 20, 1909, until late in February, 1910. A tug operated about 10 miles down the river during this period to keep a passage clear for the car ferries, but much difficulty was experienced with the ice from December 20 to 27, 1909, and on February 18, 1910. The usual conditions prevailed in Lake Erie, the heaviest fields being reported over the eastern portion. The western portion of the lake was practically free of ice by March 20, 1910, and the fields moved gradually to the extreme eastern portion and did not disappear from that section of the lake until April 30, 1910.

Over the western portion of Lake Ontario, the larger fields of ice disappeared during the early part of March, 1910. Over the extreme eastern portion the fields were broken up and disappeared during the first week of April, 1910, large quantities of the ice moving down the river.

While navigation was resumed on the lakes about April 10, 1910, there were but few vessels in commission until April 15, on account of hull insurance.

The opening and closing of navigation on the Great Lakes, 1909-10.

LAKE SUPERIOR.

Stations.	Navigation.		Ice first formed.	Greatest thickness.	Ice disappeared.	Remarks.
	Closed.	Opened.				
Duluth, Minn.....	Dec. 22, 1909	1910, Apr. 14	Nov. 21, 1909	Inches. 32	1910. Mar. 29	Ice covered the harbor on December 20. Local navigation closed on January 27, 1910, though a fish tug broke through the ice and entered the harbor on February 17, 1910, and began operations again on March 17, 1910.
Two Harbors, Minn.....	Jan. 28, 1910	Apr. 14	Dec. 28, 1909	18	Mar. 20	
Bayfield, Wis.....	Jan. 2, 1910	Mar. 29	Dec. 3, 1909	15	Mar. 20	The fire tug kept the ice in the harbor broken most of the winter.
Washburn, Wis.....	Dec. 5, 1909	Apr. 9	Dec. 9, 1909	25	Apr. 1 st	South channel open to Long Island light on March 12, 1910.
Ashland, Wis.....	Dec. 6, 1909	Apr. 9	Dec. 6, 1909	16	Mar. 24	Ice broke away from the docks on March 19, 1910.
Portage L. S. S., Mich.....	Dec. 15, 1909	Apr. 9	Dec. 9, 1909	16	Mar. 26	The first through passages were made on April 16, 1910.
Eagle Harbor, Mich.....	Dec. 20, 1909	Apr. 14	Dec. 9, 1909	16	Mar. 24	Field ice drifted in and out of harbor on night of March 26-27, 1910.
Houghton, Mich.....	Dec. 15, 1909	Apr. 5	Dec. 9, 1909	15	Mar. 28	Channel clear of ice in front of the city on March 23, 1910.
Marquette, Mich.....	Dec. 11, 1909	Apr. 16	Dec. 26, 1909	18	Mar. 17	Harbor frozen over on January 17, 1910, but was broken up on January 20, 1910. It again froze over on February 13, 1910, and remained solid till March 10, 1910.
Munising, Mich.....	Dec. 20, 1909	Apr. 25	Dec. 20, 1909	16	Mar. 29	Teams crossed to Grand Island as late as March 19, 1910.
Whitefish Point, Mich.....	Dec. 17, 1909	Apr. 12	Dec. 20, 1909	30	Apr. 3	Ice fields first formed off this point on January 3, 1910.
Sault Sainte Marie, Mich.....	Dec. 16, 1909	Apr. 11	Dec. 20, 1909	15	Apr. 1	The ferry operated below the locks all winter and reported but little difficulty on account of ice. The steamer <i>Elva</i> arrived from Detour on April 6. The Canadian locks opened on April 12 and the first passage through was steamer <i>J. E. Upson</i> up bound. The American locks opened on May 2, opening being delayed by work in widening the channel.

The opening and closing of navigation—Continued.

LAKE MICHIGAN.

Stations.	Navigation.		Ice first formed.	Greatest thickness.	Ice disappeared.	Remarks.
	Closed.	Opened.				
		1910.		Inches.	1910.	
Gladstone, Mich.	Dec. 5, 1909	Apr. 7	Dec. 8, 1909	22	Mar. 30	Harbor ice unbroken throughout the winter.
Escanaba, Mich.	Dec. 16, 1909	Apr. 6	Dec. 13, 1909	23	Mar. 31	Harbor ice unbroken throughout the winter after December 30, 1909.
Menominee, Mich.	Dec. 25, 1909	Mar. 31	Dec. 1, 1909	24	Mar. 28	
Green Bay, Wis.	Dec. 7, 1909	Mar. 30	Dec. 7, 1909	15	Mar. 25	The formation of ice on the river was later than for many years.
Plum Island, Wis.	Jan. 8, 1910*	Mar. 26	Jan. 9, 1910	18	Mar. 24	The ice did not remain solid more than a week at a time during the winter.
Sturgeon Bay, Wis.	Dec. 30, 1909†	Mar. 16	Dec. 8, 1909	36	Mar. 27	Navigation through Ship Canal opened March 27, 1910.
Kewaunee, Wis.			Dec. 8, 1909	3	Mar. 1	Car ferries, Goodrich Line steamers and fish tugs made this port all winter.
Two Rivers, Wis.			Dec. 8, 1909	5	Mar. 20	Steamers have made this port all the past winter.
Manitowoc, Wis.			Dec. 8, 1909	18	Mar. 19	Car ferries make this port all winter. General navigation opened by departure of steamer <i>Niko</i> on April 6, 1910.
Sheboygan, Wis.			Dec. 10, 1909	5	Mar. 12	Goodrich Line steamers make this port all winter. General navigation closed December 27, 1909, and opened March 30, 1910.
Milwaukee, Wis.			Dec. 10, 1909		Mar. 12	The harbor was not closed nor the entrance canal blocked by ice during the past winter.
Racine, Wis.			Dec. 12, 1909	24	Mar. 10	This port open for navigation throughout the year.
Kenosha, Wis.			Jan. 5, 1910	12		Harbor practically closed by ice from January 11 to February 15, 1910.
Chicago, Ill.			Dec. 24, 1909	10	Mar. 6	This port open for navigation throughout the year. General navigation opened on March 13, 1910.
Michigan City, Ind.	Dec. 12, 1909	Apr. 1	Dec. 5, 1909	28	Mar. 15	Inner harbor clear of ice about March 1, but the entrance to the harbor was blocked by ice fields for a period after that time.
St. Joseph, Mich.	Dec. 24, 1909	Mar. 14	Nov. 27, 1909	30	Mar. 20	Fish tugs blasted a channel and worked out of the harbor February 28, 1910.
South Haven, Mich.	Nov. 30, 1909	Apr. 1	Dec. 6, 1909	6	Mar. 22	Harbor clear of ice March 6, but entrance later blocked by ice fields.
Holland L. S. S., Mich.	Jan. 4, 1910	Mar. 16	Dec. 19, 1909	12	Mar. 28	Harbor clear of ice about March 1, but later blocked by ice fields.
Grand Haven, Mich.			Dec. 7, 1909			Harbor entrance clear of ice about March 1, but blocked by ice fields for two weeks after that date.
Muskegon, Mich.	Nov. 30, 1909	Mar. 16	Dec. 18, 1909	22	Mar. 22	Harbor closed by ice only on February 18, 19, and 20, 1910, and steamers made this port regularly, except as noted, throughout the winter.
Pentwater, Mich.	Dec. 24, 1909	Mar. 23	Dec. 20, 1909	20	Mar. 21	Steamer <i>Indiana</i> broke through the ice and entered harbor on January 10, 1910, but was somewhat delayed by ice after beginning regular trips.
Ludington, Mich.			Dec. 8, 1909	22	Mar. 24	Inside harbor frozen, but channel free of ice most all winter.
Manistee, Mich.			Dec. 9, 1909	19	Mar. 22	Harbor kept open by car ferries and other steamers which make this port throughout the year. Navigation delayed by ice only for few hours during the last week in February, 1910.
Frankfort, Mich.			Dec. 8, 1909	24	Mar. 16	Pere Marquette steamers make this port weekly and were delayed but once during the past winter when on February 24-25 an ice field blocked the harbor entrance about 30 hours. General navigation closed on December 18, 1909, and opened on March 24, 1910.
South Manitou Island, Mich.	Dec. 13, 1909	Mar. 31	Feb. 17, 1910	3	Mar. 15	Harbor kept open by car ferries. General navigation closed December 29, 1909, and opened April 2, 1910.
Glen Haven, Mich.	Dec. 2, 1909	Apr. 6	Feb. 18, 1910	5	Mar. 16	The ice in the harbor and in Manitou Island passage was broken up and moved out by soft weather and southwest winds on March 2.
Charlevoix, Mich.	Dec. 5, 1909	Mar. 31	Dec. 8, 1909	16	Mar. 31	The mail boat cleared for South Manitou Island on March 4 and began regular trips on the 16th. The Beaver Island mail boat ran till January 1, 1910, and the tug <i>McCann</i> made a trip with mail on January 25, 1910.
Harbor Springs, Mich.	Nov. 20, 1909	Apr. 7	Jan. 9, 1910	14	Apr. 1	A large field of ice lay off this port during most of March, 1910.
St. James, Beaver Is'ld, Mich.	Jan. 15, 1910	Mar. 28	Jan. 10, 1910	18	Apr. 5	Large fields of ice, drifting with the wind most of the time, surrounded the island during March.
Mackinaw City, Mich.	Dec. 16, 1909	Apr. 4	Dec. 6, 1910	18	Apr. 1	Car ferries operated all winter. Open water from the Point to St. Ignace on February 5, 1910. Last boats through were steamers <i>City of Genoa</i> and <i>City of Naples</i> on December 16, 1909, and the tug <i>Arthur</i> passed down on April 4, 1910. Less ice than during the average season.

*Lights closed.

†Navigation through ship canal closed December 24, 1909.

LAKE HURON.

Mackinac Island, Mich.	Dec. 15, 1909	Mar. 25	Dec. 28, 1909	16	Apr. 1	Steamer <i>Algoma</i> broke the ice and landed on the Island on February 4, 1910, and continued delivering the mail till the 8th, after which, on account of the ice she did not make the island till March 25, 1910.
Detour, Mich.	Dec. 18, 1909	Apr. 6	Jan. 1, 1910	12	Apr. 1	Tugs <i>General</i> and <i>Thompson</i> kept the harbor ice broken till February 7; and the steamer <i>Ela</i> cleared for Sault Sainte Marie on April 6, 1910.
Cheboygan, Mich.	Dec. 30, 1909	Apr. 1	Dec. 25, 1909	12	Mar. 23	The steamer <i>Islander</i> broke 4 inches of ice in the harbor and 10 inches of ice outside on December 30, 1909, to reach the dock.
Presque Isle Lt., Mich.	Dec. 16, 1909	Apr. 4	Nov. 23, 1909	20	Mar. 26	Harbor ice began breaking on March 6 and the harbor was clear of ice on March 15, 1910.
Middle Island, Mich.		Apr. 5	Dec. 1, 1909	12	Mar. 29	Unknown steamer passed up on April 5, 1910, the first of the season.
Thunder Bay Island, Mich.	Dec. 16, 1909	Mar. 12	Dec. 7, 1909	8	Mar. 21	The ice fields off this island were on the move all winter. The first steamer passed, up bound, on April 5, 1910.
Alpena, Mich.	Dec. 18, 1909	Mar. 12	Dec. 9, 1909	14	Mar. 6	Harbor ice broken up by south winds and thawing weather early in March, and the ice moved out of Thunder Bay on March 6-7, 1910.
Oscoda, Mich.	Dec. 18, 1909	Mar. 20		5	Mar. 17	
Ottawa Point, Mich.	Dec. 10, 1909	Apr. 3	Nov. 23, 1909	22	Mar. 22	Most of the ice in the harbor was driven out by a northerly gale on January 22, 1910.
Bay City, Mich.	Dec. 5, 1909	Apr. 1	Dec. 7, 1909	18	Mar. 19	
Point aux Barques, Mich.	Dec. 11, 1909	Mar. 13	Dec. 6, 1909	14	Mar. 12	Harbor ice broken up during January by thawing weather and high winds.
Harbor Beach, Mich.	Dec. 24, 1909	Mar. 15	Dec. 15, 1909	10	Mar. 15	
Port Huron, Mich.	Dec. 17, 1909	Mar. 22	Dec. 9, 1909	18†	Mar. 6	Ice in St. Clair River kept broken by ferries. The first through passage was steamer <i>W. H. Mack</i> , down bound, on April 13, 1910.

*Unknown steamer passed up on January 12, 1910.

†Measurement made in Black River.

DETROIT RIVER.

Detroit, Mich.	Dec. 8, 1909	Mar. 28	Nov. 23, 1909	12	Mar. 22	The last up bound steamer, <i>City of Genoa</i> , passed on December 13, 1909, and the last down bound were the steamers <i>Strathcona</i> and <i>Donnacova</i> on December 18, 1909. They were several days getting out of the river. The steamers <i>Boyce</i> and <i>Eddy</i> attempted to follow, but gave up the battle on December 23. The steamers <i>Britannia</i> and <i>Pleasure</i> forced a passage to Lake Erie on January 19, 1910, en route for Toledo, Ohio. The first through passages were the steamers <i>Wm. A. Payne</i> , up bound, and <i>M. T. Greene</i> , down bound, on April 11, 1910. Navigation was considered closed on the arrival of the last D. & C. Line steamer, <i>City of St. Ignace</i> , on December 8, 1909; and open on the departure of the steamer <i>City of Detroit</i> , of the same line, for Cleveland, on March 28, 1910.
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The opening and closing of navigation—Continued.

LAKE ERIE.

Stations.	Navigation.		Ice first formed.	Greatest thickness.	Ice disappeared.	Remarks.
	Closed.	Opened.				
Toledo, Ohio.....	Dec. 13, 1909	1910. Mar. 18	Dec. 9, 1909	15 Inches.	1910. Mar. 6	High wind and high water broke up the ice in the harbor on December 15, but it formed again the following day; and on account of danger from a possible ice blockade, the steamers <i>Britannia</i> and <i>Phasor</i> were employed in breaking up the ice in the Maumee River and harbor January 21-26, 1910. Considerable ice formed after this time, but it broke up and moved out on one day (March 6, 1910).
Put-in-Bay, Ohio.....	Dec. 29, 1909	Mar. 19	Dec. 1, 1909	20	Mar. 28	Teams were still crossing to Port Clinton on February 28. The south passage was reported open on March 5, 1910.
Kelleys Island, Ohio.....	Dec. 23, 1909	Mar. 19	Dec. 6, 1909	12	Mar. 28	After freezing over, the ice in the bay remained intact throughout the winter, except that the channel was kept open by steamer <i>Lakeside</i> until December 29, 1909.
Marblehead, Ohio.....	Dec. 17, 1909	Mar. 23	Dec. 18, 1909	18	Mar. 26	
Sandusky, Ohio.....	Dec. 21, 1909	Mar. 18	Dec. 8, 1909	20	Mar. 17	The harbor ice broke up on March 7 and moved out on March 14, 1910.
Huron, Ohio.....	Dec. 19, 1909	Mar. 22	Dec. 8, 1909	17	Mar. 20	The harbor ice was broken up in December and again on January 16, after which it was undisturbed until March 1, reaching a thickness of 18 inches.
Vermilion, Ohio.....	Dec. 2, 1909	Mar. 5	Nov. 30, 1909	10	Mar. 16	Tugs kept the harbor ice broken up all winter.
Lorain, Ohio.....	Dec. 31, 1909	Mar. 5	Dec. 7, 1909	18	Mar. 11	Lake ice moved 4 to 6 miles off shore on night of February 26-27, 1910. Harbor ice began breaking up on March 7 and harbor was nearly clear of ice by the 14th.
Cleveland, Ohio.....	Dec. 15, 1909	Mar. 27	Dec. 17, 1909	18	Mar. 19	Harbor ice undisturbed until the first week in March.
Fairport, Ohio.....	Dec. 18, 1909	Mar. 31	Nov. 18, 1909	16	Mar. 29	Ice fields observed 3 or 4 miles off shore during last week in March.
Ashtabula Harbor, Ohio.....	Dec. 24, 1909	Mar. 21	Dec. 16, 1909	16	Mar. 21	Harbor ice broken by car ferries until January 4, 1910, after which it remained intact till the first week in March.
Conneaut Harbor, Ohio.....	Jan. 4, 1910	Mar. 12	Dec. 7, 1909	13	Mar. 31	Fish tugs broke through the ice and got out on March 25, but the first vessel to make this port was steamer <i>Julia H. Merrill</i> on April 9, 1910.
Erie, Pa.....	Dec. 18, 1909	Mar. 25	Dec. 18, 1909	16	Apr. 4	The harbor was clear of ice on March 20, but at that time the lake was covered by ice as far as the eye could reach.
Dunkirk, N. Y.....	Dec. 22, 1909	Apr. 27	Dec. 26, 1909	10	Apr. 11	Harbor ice kept broken up by tugs. Ice fields in the lake extended beyond vision during March and the greater portion of April. The steamer <i>Mary A. Boyce</i> forced a passage through the ice on April 10 and the steamer <i>Tray</i> cleared on the same date; general navigation, however, did not open until about 10 days later.
Buffalo, N. Y.....	Dec. 24, 1909	Apr. 10	Dec. 17, 1909	18	Apr. 30	

LAKE ONTARIO.

Fort Niagara, N. Y.....	Dec. 8, 1909	May 12*	Dec. 9, 1909	12	Apr. 26	Harbor ice kept broken by swift current of Niagara River. There is never much ice formed here.
Charlotte, N. Y.†.....						The ice that hinders navigation at this point comes down the Niagara River from Lake Erie.
Sodus Point, N. Y.....	Dec. 15, 1909	Mar. 31	Dec. 16, 1909	18	Mar. 25	No ice in harbor on March 5 and car ferry captains report no ice observed in the lake between Coburg, Ont., and this port on same date.
North Fair Haven, N. Y.....	Dec. 1, 1909	Apr. 6	Dec. 18, 1909	18	Mar. 28	No ice fields observed in the lake during March, 1910.
Oswego, N. Y.....	Dec. 16, 1909	Mar. 24	Dec. 10, 1909	18	Mar. 17	Very few fields of ice observed off this port during the winter.
Sacketts Harbor, N. Y.....	Dec. 14, 1909	Apr. 7	Dec. 13, 1909	15	Mar. 29	Channel open up to the bridge on March 5 and the steamer <i>Hinckley</i> began setting buoys on the 24th.
Cape Vincent, N. Y.....	Dec. 30, 1909	Mar. 26		12	Apr. 6	This port open for navigation on March 29 and all ice disappeared on that date but there were no boat arrivals or departures till April 7, 1910.
Ogdensburg, N. Y.....	Dec. 17, 1909	Apr. 7	Dec. 1, 1909	15	Apr. 1	Navigation opened by arrival of steamer <i>Pierrepoint</i> from Kingston, Ont.

*This port was open for navigation on March 1, so far as ice conditions were concerned. †General navigation closed on December 11, 1909, and opened on March 18, 1910; car ferries operated throughout the winter.